

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: Botrychium lineare

COMMON NAME: Slender moonwort

LEAD REGION: 1

INFORMATION CURRENT AS OF: April 16, 2007

STATUS/ACTION:

☐ Species assessment - determined species did not meet the definition of endangered or threatened under the Act and, therefore, was not elevated to Candidate status

☐ New candidate

☐ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: July 26, 1999

☒ 90-day positive - FR date: May 10, 2000

☒ 12-month warranted but precluded - FR date: June 6, 2001

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? no

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? ☐

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): June 6, 2001

☒ Candidate removal: Former LP: 11

☒ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status. (See narrative below)

☐ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

☐ F – Range is no longer a U.S. territory.

☒ I – Insufficient information exists on biological vulnerability and threats to support listing. (See narrative below)

☐ M – Taxon mistakenly included in past notice of review.

☐ N – Taxon does not meet the Act's definition of "species."

☐ X – Taxon believed to be extinct.

A: *Botrychium lineare* is more widespread than previously believed. Based on the results of increased survey efforts, since 2003, at least 12 new population sites have been found

in six States, including four States where it had not been previously known, and two Canadian provinces. At this time, there are 22 known sites in 8 States and 2 Canadian provinces that are disjunct and dispersed over large geographic range. Over 3,300 miles separate the Alaska and Minnesota population sites.

The plants are small, difficult to locate, and difficult to identify in the field, making them difficult to detect in plant surveys. When detected in plant surveys, population sites are generally small in area and number of individuals (see Table 1). Some populations previously identified as *B. lineare* based on field collections, and described in previous Candidate Notice of Reviews (70 FR 24870), are now considered something other than *B. lineare* based on genetic analysis.

Because this species is found in a variety of habitat types and often found in disturbed habitats, describing suitable or specific habitat is problematic. Based on the results of surveys, we believe that the species is likely more widespread than currently reported, and that many more undiscovered populations exist, both within and outside of the large un-surveyed geographic range of the species in the United States and Canada. While potential threats have been identified for many of the current extant sites, it is not clear how these threat factors may impact the species in its various natural and human-altered habitats, and not all extant populations are exposed to threat factors.

I: Some researchers consider *Botrychium lineare* a habitat generalist since it is found in a variety of natural and human-altered habitat types. The species may be an opportunistic colonizer and several extant population sites are found in sites disturbed by human activity (i.e., roadsides and roadbeds, mine tailings, and along stream banks). These sites are naturally subject to a certain level of disturbance that *B. lineare* appears to tolerate. *B. lineare* has also established populations in non-disturbed habitats such as meadows and forests, so periodic disturbance of the soil does not appear to be a requirement for occupation.

Much of the information provided to us regarding potential threat factors to *Botrychium lineare* is general in nature or there is uncertainty and very little documentation on how potential threats are impacting existing populations, individual plants or its various habitat types. Where land managers have recognized that threats could be impacting *B. lineare* populations, various conservation measures are being implemented. In total, potential threats are being addressed at 8 of the 20 *Botrychium lineare* populations in the United States (two Canadian population sites not included). Invasive, nonnative species are reported to occur within 4 populations, and adjacent to 10 (6 populations for which the amount of habitat impacted was identified and 4 populations for which the amount of habitat impacted was not identified). Conservation measures to reduce the occurrence of invasive species are underway at seven of these sites in Colorado, Montana, and Oregon. Monitoring to detect presence of additional invasive species is currently conducted at two additional sites in Oregon. Thirteen populations occur adjacent to or near roads; avoidance and minimization measures are in place at four sites in Colorado and one site in South Dakota to reduce the impact of road-related activities. Grazing occurs at seven populations, and may occur at one more site. Livestock impacts have been precluded at one site in Washington through an exclosure.

In summary, we believe that there is insufficient information available to:

- Adequately describe *Botrychium lineare*'s overall or potential geographic distribution. Much of the current geographic range has not been surveyed and we believe many more, undiscovered populations exist;
- Adequately describe specific or suitable habitat for *B. lineare*. The species seems to be a habitat generalist, making it difficult to identify potential areas to conduct surveys, or describe the species' primary constituent elements (PCEs)
- Fully understand *B. lineare*'s biological vulnerability to potential threat factors throughout all or a significant portion of its range to support a proposed listing rule.

ANIMAL/PLANT GROUP AND FAMILY: Flowering Plant, Ophioglossaceae (Adder's tongue) Family

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE:
California, Colorado, Idaho, Montana, Utah, and Washington; Quebec and New Brunswick, Canada.

CURRENT STATES/ COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Alaska, Colorado, Minnesota, Montana, Oregon, South Dakota, Washington, and Wyoming; Alberta, and Yukon Territory, Canada.

LAND OWNERSHIP:

Of the 22 known populations of *Botrychium lineare* in the United States and Canada, 4 are on private lands (near Empire, Colorado; Lostine Canyon, Oregon; Trommald, Minnesota; and Drywood Creek, Alberta, Canada), 1 site is of uncertain land ownership, and the rest are found on Federal (U.S. Forest Service, National Park Service), and on Tribal lands (Blackfoot Nation, and Confederated Salish and Kutenai Tribes) and Canadian National Park lands.

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LEAD FIELD OFFICE CONTACT: Snake River Fish and Wildlife Office, 208-378-5243, Steve_Duke@fws.gov

BIOLOGICAL INFORMATION

Species Description

A member of the adder's-tongue family (Ophioglossaceae), *Botrychium lineare* is a small perennial fern with a pale green leaf (trophophore) from 6 to 18 centimeters (2 to 7 inches) long and a grape cluster-like structure (sporophore) approximately the same length as the trophophore. Leaf segments are typically linear and divided or forked at the ends. Spores mature primarily in late June and July. Similar to other *Botrychium* species, the tiny, lightweight spores may be disseminated by wind, water, or possibly by animal vectors (Zika et al. 1995, p. 30).

The nearest relative of *Botrychium lineare* is thought to be *B. campestre*, a widespread species that is typically found in grassland habitats at lower elevations than *B. lineare* (Wagner and Wagner 1994, pp. 8-9). *B. lineare* is one of the many *Botrychium* species that reproduces vegetatively through root gemmae which may explain low genetic diversity. *B. lineare* also produces spores. *Botrychium* spores are extremely difficult to cultivate making it difficult to test the viability of spores (Johnson-Groh and Lee 2002, p. 1630).

Taxonomy

B. lineare was initially described in 1994 (Wagner and Wagner 1994, pp. 5-10). Beginning in the late 1990s, a focused effort has been made to resolve the specific distinctiveness of the western moonwort species (Farrar 2000, p. 2). Relatively recent advances in molecular techniques have made it possible to accurately identify many of the closely related *Botrychium* species (Swartz and Brunsfeld 2002, p. 250; Farrar 2004, p. 13). Specifically, indirect DNA analysis through starch-gel enzyme electrophoresis has been used successfully by researchers to differentiate populations of *Botrychium* based on the relative proportion of specific alleles in a population (Farrar 2004, p. 13; Farrar 2006, p.19). Research regarding the taxonomy of *B. lineare*, and several close relatives including *B. campestre*, *B. 'furcatum'* (a species or variety not yet formally named), and stable tetraploid hybrid species is underway.

The taxonomic question relating to *Botrychium lineare* and *B. campestre* is whether they each merit full species or varietal/subspecies status. A metric of genetic diversity, Genetic Identity (GI), may be used to assist such a determination. In flowering plants different populations of the same species have an average GI value of 0.95, with a range of 0.8 to 1.0 (as cited in Farrar 2006, p. 19). The average GI value between species varieties is 0.91, with a range of 0.71 to 0.99. Between species in the same genus the average GI is 0.73, with a range of 0.35 to 0.99. In comparison, the average GI between *Botrychium* species is 0.48 with a range of 0.18 to 0.80. The GI value between *B. campestre* and *B. lineare* is 0.8019 (Farrar 2006, pp. 19-21), suggesting that *B. lineare* may be a subspecies/variety of *B. campestre* (Farrar 2004, p. 14; Farrar 2006, p. 20). Researchers have also found stable tetraploid ($4n = 90$) hybrids resulting from the crosses of the diploid ($2n = 45$) sister taxon, *Botrychium lineare* and *B. campestre*. Tetraploid plants are fully capable of evolving as independent species (allopolyploid speciation) (Farrar 2004, p. 16; Farrar 2005, p. 19), and those *Botrychium* that are tetraploid may in the future be described as novel taxa. Research funded by the Service is underway and we anticipate further resolution of *B. lineare* and *B. campestre* taxonomy in 2008. In the meantime, our analysis for determining continued candidate status of *B. lineare* will be based on the currently accepted taxonomic classification, giving *B. lineare* full species rank.

Botrychium Reproduction (from Farrar 2006, p. 30)

In order to understand the distribution of genetic and morphological variation within and between species, it is necessary to understand the reproductive biology of moonwort ferns. Being pteridophytes, they have two separate life stages. The relatively large above-ground sporophyte produces spores that have half the number of chromosomes of

the parent sporophyte. These spores germinate underground and grow into the gametophyte stage. Each gametophyte produces both male and female gametangia containing sperm and eggs, respectively. When a sperm is released from a mature antheridium, it swims to an open archegonium, then down the archegonial neck to an egg with which it fuses to initiate the next sporophyte generation. These acts of sexual reproduction take place underground. Travel through soil by swimming sperm must be considerably hindered relative to sperm swimming in liquid on the soil surface as is the case for most ferns. In the underground environment, sperm from one gametophyte plant may be unable to reach another gametophyte more than a few millimeters distant. They are quite capable though of swimming to archegonia and fertilizing eggs on the same gametophyte less than one millimeter away. This union of gametes from the same gametophyte constitutes intragametophytic self-fertilization.

Enzyme electrophoresis allows recognition of heterozygous individuals, those containing two different alleles at a given gene locus. Because heterozygous individuals of diploid species can be produced only by crossfertilization between different gametophytes, electrophoretic determination of the number of heterozygous individuals in a population of a diploid species allows estimation of the amount of cross-fertilization that is occurring. Of thousands of individual *Botrychium* plants examined electrophoretically in several studies (Soltis and Soltis 1986, Hauk and Haufler 1999, Farrar 1998, 2001), less than 1 percent have shown heterozygosity from out-crossing. This observation provides strong support for the hypothesis that sexual reproduction in *Botrychium* is predominantly by intragametophytic self-fertilization. Intragametophytic self-fertilization in pteridophytes has several important genetic consequences. Because all cells of an individual gametophyte are derived from a single initial cell, sperm and eggs produced by that gametophyte are genetically identical. Fertilization of an egg by sperm from the same gametophyte unites identical genotypes. The resulting sporophyte has exactly the genotype of the gametophyte from which it was produced. When that sporophyte produces spores, those too will be all be genetically identical and identical to the original gametophyte. Gametophytes growing from those spores will likewise be of the same genotype, and so on, as long as intragametophytic selfing occurs. With no means of generating genetic variability (except by rare mutations) sexual reproduction in *Botrychium*, through intragametophytic self-fertilization, becomes equivalent genetically to vegetative reproduction.

Habitat/Life History

Surveys and field identification of moonworts (*Botrychium*) are complicated by their biology and because of morphological similarity between species. The plants are small, difficult to find, usually scarce. Additionally, they cannot be positively identified in their immature states. Field identification is normally based on specimen morphology. Because *Botrychium* species have few diagnostic features, *B. lineare* can be difficult to distinguish from other closely related moonworts. For example, three former *B. lineare* population sites in Idaho (1) and Nevada (2) described in the May 11, 2005 Candidate Notice of Review (70 FR 24870) are now considered something other than *B. lineare* based on genetic analysis, and are not considered in this analysis. Fronds may appear above ground during some growing seasons, and may not appear at all during unfavorable seasons (Vanderhorst 1997, p. 2). All *Botrychium* species are believed to be

obligately dependent on mycorrhizal fungi (the symbiotic association of a fungus with the roots of a vascular plant) throughout their life cycle. Similar to orchids, *Botrychium* species can remain dormant for one or more years, and cannot be identified with certainty in their immature stages.

A specific habitat description for *Botrychium lineare* is problematic because of its historical and current disjunct distribution in North America. Wagner and Wagner (1994 pp. 8-9) described its habitat as “deep grass and forbs of meadows, under trees in woods, and on shelves on limestone cliffs, mainly at higher elevations,” but they also acknowledged that it is difficult to describe a typical habitat since the known sites are so different. Some botanists consider *B. lineare* to be a habitat generalist (Maria Mantas, Botanist, Flathead National Forest, pers. comm. 2002), and believe that *B. lineare* is a rare plant that is difficult to survey for and observe in the wild, and is often found along roadsides in disturbed habitats (Steve Shelley, Regional Botanist, U.S. Forest Service (Forest Service), pers. comm. 2002). Mr. Shelley believes that *B. lineare*, often co-occurring with other *Botrychium* species, may be an opportunistic colonizer, occupying “disturbed” habitats that can be considered a type of early successional habitat. For example, 12 sites are on or near roadbeds, at least one is along a stream bed, and many are in meadows. All five of the known *B. lineare* populations in Glacier National Park, Montana, occur on roadsides in early to mid-successional habitats (i.e., open habitat dominated by low-growing herbaceous plants rather than shrubs or trees) including mid-height grasslands, grazed rangelands, wet limestone shelves, woodland trails, roadside gravels, and in grass under conifers (Barton and Crispin 2004, p. 7-9). Additionally, *B. lineare* has been found at two mine sites, in an old iron mine tailings ponds in Minnesota and a historical site on private land near Empire, Colorado (USFWS in litt. 2007).

The reason for the disjunct distribution pattern of *Botrychium lineare* is unclear (Figure 1). Part of the explanation could lie in the small stature and associated difficulties in locating the species. Some have proposed that *Botrychium* spores are small and lightweight enough to be carried by air currents, which may explain this dispersal pattern (Vanderhorst 1997, p. 5). Others have suggested that these are evolutionarily old species that once had a much wider distribution and are now confined to disjunct, widely separated sites (Nekola and Schlicht 1996, p. 122). Other mechanisms may include the plant’s affinity for a specific soil type or strong relationships with mycorrhizal fungi. Recent discoveries in more northern latitudes (such as Alaska and Canada) suggest the species may be more common there. Further surveys in Alaska and Canada will occur in 2007.

Historical Range/Distribution

Historical populations of *Botrychium lineare* were previously known from California (Mono and Tulare Counties), Colorado (Boulder, Grand, and Lake Counties), Idaho (Boundary County), Montana (Lake County), Utah (Duchesne and Salt Lake counties), and Canada (Quebec and New Brunswick). These populations have not been detected during site visits for several years and may be extirpated (Wagner and Wagner 1994, p. 8; Barton and Crispin 2004, p. 9; Popovich 2004; Donald Farrar, Professor, Iowa State University, pers. comm. 2004).

Current Range/Distribution

In order to accurately determine the status of all populations of *Botrychium lineare* in the United States, we contacted over 60 individuals associated with Federal, Tribal, and State agencies; educational institutions; and private individuals and organizations. We also standardized our separation distance between Element Occurrences at 1 kilometer (0.6 miles) (NatureServe 2002, p. 26; Colket et al. 2006, Appendix A) and called sites historical if they had not been seen in the last 10 years. Based upon the best commercial and scientific information available, the current range of *Botrychium lineare* in the United States and Canada is approximately 107,344 square miles and is spread across eight States (Alaska, Colorado, Minnesota, Montana, Oregon, South Dakota, Washington, and Wyoming, see Figure 1) and two Canadian Provinces (Alberta, and Yukon Territory). Over 3,300 miles (5,300 kilometers) separate *Botrychium lineare* sites in Alaska and Minnesota.

Table 1 identifies the existing populations within the United States, based on a 1 kilometer (0.6 mile) separation distance. There have been 37 identified populations of *B. lineare* in the United States and Canada, however 6 of these populations have not been relocated in the past 10 years, and 9 have not been relocated in the past 30 years, leaving only 22 extant populations (20 in the United States). It is likely that new sites will continue to be found, particularly in the western States and Canada, as increased survey efforts by land management agencies, non-governmental organizations, and the public search for this species.

Table 1. Known extant occurrences of *Botrychium lineare*.

State	Most recent survey year	Population name	County	Land Ownership	# of plants observed in most recent survey	Genetically confirmed as <i>B. lineare</i> *
Alaska	2003	Chisana Airstrip	n/a	Federal	3	yes
Alaska	2003	Chisana River	n/a	Federal	n/a	no
Colorado	2005	Pikes Peak 4	El Paso	Federal	29	yes
Colorado	1998	Pikes Peak 3	El Paso	Federal	2	no
Colorado	2004	Empire	Clear Creek	private	n/a	yes
Minnesota	2006	Trommald	Crow Wing	private	37	yes
Montana	2006	Apikuni	Glacier	Federal	n/a	yes
Montana	2005	St. Mary Ridge	Glacier	Tribal	40	yes
Montana	2005	Chief Mountain Road	Glacier	Federal	67	yes
Montana	2005	Siyeh Bend	Glacier	Federal	6	yes
Montana	2005	Siyeh Bend South	Glacier	Federal	50	yes
Oregon	2000	Lostine Canyon	Wallowa	private	3	yes
Oregon	2001	Upper Hurricane Creek	Wallowa	Federal	10	no
Oregon	2003	Lower Hurricane Creek	Wallowa	Federal	34	yes
South Dakota	2006	Wind Cave NP	Custer	Federal	25	yes
South Dakota	2006	Boles Canyon	Custer	Federal/private	25	yes
South Dakota	2006	Witch Spring	Custer	Federal	25	yes
Washington	2006	Bailey Creek	Ferry	Federal	8	no
Wyoming	2003	Dugout Gulch	Crook	Federal	29	yes
Wyoming	2006	Williams Gulch	Crook	Federal	0	yes
Alberta, CA	2002	Drywood Creek	Unknown	Private	2	yes
Yukon Territory	2003	Soldier's Summit trail	Kluane N.P.	Federal	n/a	?
* Populations not confirmed as <i>B. lineare</i> have not yet been tested, or test results are not yet available.						

Population Estimates/Status

Although *Botrychium lineare* occurs in both the United States and Canada, the majority of the available information is on the populations within the United States. Known extant populations of *Botrychium lineare* are generally small, ranging in size from two plants at the Pikes Peak (EO #3), Colorado site, to approximately 67 plants at the Chief Joseph Road, Montana site, in the most recent survey years (see Table 1). Eleven sites contained 15 or more plants during the most recent surveys. These observed counts should be viewed only as estimates since *Botrychium* species are difficult to survey for, may not come up every year, and can exist below ground for most of their life cycle. The appearance of above ground fronds is affected by general habitat and climatic conditions. Populations with the largest number of recently observed individuals ($n > 30$) occur in Trommald, Minnesota; Glacier National Park, Montana; and on the Wallowa-Whitman National Forest in Oregon. Known extant sites for *B. lineare* are generally small in area (i.e. < 10 ha) (USFWS in litt. 2007).

Botrychium lineare is a perennial species that may or may not appear during any given year, therefore long-term monitoring is needed to detect trends within populations. Only two sites (one at Bailey Creek on the Colville National Forest in Washington and one at Pikes Peak, Colorado), have been monitored for over ten years (Cameron in litt. 2005, Amy Cabral, Biologist, U.S. Forest Service, pers. comm. 2006). To our knowledge, only the site at Pikes Peak is monitored using a well established protocol. This protocol utilizes censusing techniques and a permanent macroplot 30 by 60 meters (m) (98 by 197 feet (ft)). In addition, plants are tagged. Census data has shown a wide variation in the number of plants observed, with 53 plants seen in 1996, 40 in 1998, 33 in 2000, 36 in 2001, 20 in 2003, and 29 in 2005. It should be noted that the 2005 count was only a partial count. Given this data, it is difficult to determine the trend of this population. The Bailey Creek site had 3 plants in 1996, 3 in 1997, 8 in 1998, 8 in 2000, 10 in 2002, 5 in 2003, 9 in 2004, 9 in 2005, and 8 in 2006 (Amy Cabral, Biologist, U.S. Forest Service, pers. comm. 2006). The number of individuals detected at the Bailey Creek site has been relatively constant, although the numbers are low.

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

The most frequently reported potential threats to extant populations of *Botrychium lineare* were those associated with invasive species, roads (e.g. road maintenance and construction), and grazing activities (i.e., native, nonnative, or domestic animals) (USFWS in litt. 2007).

Invasive species: Invasive species have been reported in or near *Botrychium lineare* populations at 14 of the 20 sites. Of these 14 sites, 4 have nonnative, invasive species within the *B. lineare* populations. At the Pikes Peak 4 site in Colorado, *Linaria vulgaris* (yellow toadflax) occurs within the population; spraying is conducted to control it. At the St. Mary Ridge site in Montana, *Centaurea maculosa* (spotted knapweed) is present within approximately 57 percent of the population; approximately 15 percent of the habitat within the population is estimated as occupied. At the Siyeh Bend site in Montana, *Bromus inermis* (smooth brome) is present within approximately 20 percent of the *B. lineare* population, and *Leucanthemum vulgare* (oxeye daisy) is present as well. The Park Service is currently spraying to control the oxeye daisy incursion; it is unlikely that this spraying will also control smooth brome. At the Boles Canyon site in South Dakota, smooth brome is also present, although the amount of habitat impacted was not quantified. Six sites have various nonnative, invasive species adjacent to *Botrychium lineare* populations and within the habitat. The amount of *B. lineare* habitat occupied by nonnative species at these sites ranges from 10 (4 sites: Empire, Colorado; Lostine, Upper Hurricane, and Lower Hurricane, Oregon); to 20 (Chief Mountain, Montana); to 30 percent (Apikuni, Montana).

Conservation measures are currently being implemented to control the spread of invasive plant species at 7 of the 14 sites: 2 sites in Colorado, 4 sites in Glacier National Park in Montana, and Lostine Canyon in Oregon. Herbicide application is occurring at six sites in Colorado and Montana (Steve Olson, Botanist, U.S. Forest Service, pers. comm. 2007; Tara Carolin, Ecologist, National Park Service, pers. comm. 2006), and hand pulling is occurring at one site in Colorado and one site in Oregon. Land management agencies responsible for the populations in Colorado and Montana are actively implementing conservation measures. The Forest Service is also hand pulling invasive species that are detected within the Lostine Canyon population (on private land), so the nonnative threat at this location is reduced.

Various nonnative, invasive species were reported adjacent to *B. lineare* populations and within the habitat at four sites, but a threat to *B. lineare* was not identified by agency biologists or researchers (USFWS in litt. 2007). Yellow toadflax occurs at one of these sites, and *B. lineare* has not been detected at this site for the past nine years. If *B. lineare* is not detected in the tenth year of surveys, this site will be considered historical. Smooth brome occurs at another one of the four sites and may be impacting the *B. lineare* there, but because we lack information to document any impacts, we must consider this situation a potential future threat. A number of nonnative, invasive species are reported adjacent to the two *B. lineare* populations in South Dakota, but these species were not reported as a threat and it is unknown whether they are having any impact on *B. lineare*. For these four sites, we lack information documenting that nonnative, invasive species

that are present adjacent to *B. lineare* populations are adversely impacting them.

Herbicide Application: Herbicide application is a concern for one population of *Botrychium lineare* at St. Mary Ridge in Montana. It is important to note that the threat of herbicide application is distinguished here from the careful spot spraying efforts that are currently being conducted at the Pikes Peak 4 site in Colorado expressly to conserve *B. lineare*. That effort is considered a conservation measure and not a threat. We further distinguish between the risk of careful spot spraying for invasive species control efforts, which is currently occurring at six *B. lineare* locations, and general spraying, which is currently occurring at one occupied site. The risk to *B. lineare* from careful spot spraying is very low and is not considered a threat to the species. In fact, this type of herbicide application has been cited as a potential benefit to *B. lineare* due to the control of invasive plant species within *B. lineare* habitat (Tara Carolin, pers. comm. 2006). In contrast, the general spraying that is currently occurring at St. Mary Ridge does not take into consideration the location of *B. lineare*, and herbicide application may be occurring within or throughout that population, although we lack information on the imminence and severity of this potential threat. Based on the currently available information (USFWS in litt. 2007), the threat of herbicide application to *B. lineare* is localized to one population in MT, and of small exposure.

Road maintenance: Thirteen of the 20 known *Botrychium lineare* populations occur alongside or near roads. Ten of these populations are near roads open to car and truck travel, one is near a road that is open to off-road vehicle travel, one is on the opposite side of the road from the vehicle pull-out, and vehicle access is temporarily not allowed in the area of one population (road is closed due to fire-related damage and rehabilitation). Twelve of these populations are potentially at risk of crushing from traffic and road maintenance, widening, and grading. Vehicle and road maintenance may also result in indirect impacts to *B. lineare* individuals, by allowing vehicular travel through occupied habitat (seeds may be carried in vehicle tires), and by facilitating the spread of nonnative, invasive species through the maintenance of disturbed habitats where invasive species may have a competitive advantage. Road maintenance activities that occur prior to spore maturation and dispersal could adversely affect the reproduction of *B. lineare*. Although these adverse effects are possible at 12 of the 20 sites, and were historically possible at an additional population site, the magnitude and severity of impacts of vehicle travel (crushing) and road maintenance activities (crushing, obliteration) have not been documented and are therefore uncertain.

All four populations within Glacier National Park occur along existing road shoulders subject to maintenance. The exposure of *Botrychium lineare* populations to this threat has been reduced by conservation actions currently being implemented. Road maintenance crews in the park are provided with *B. lineare* site maps annually and delay mowing until after July 15, when the species has released its spores. When they begin mowing after July 15, they retain a minimum vegetation height of four inches, which is estimated to exceed the height of *B. lineare* individuals. In addition, road crews spot spray nonnative plants along those stretches to reduce the potential for invasion by undesirable species. Compliance with the maps and mowing schedule has been good to date.

Conservation measures for *Botrychium lineare* are also in place at the Boles Canyon, South Dakota population. This population is adjacent to a Forest Service gravel road, and has been subject to past road maintenance activities. The Forest Service now has avoidance measures in place to eliminate impacts to the *B. lineare* population from road-related activities.

In contrast, at the Williams Gulch site in Wyoming, a fire occurred in 2004-2005. In response to the fire, the roadbed was bladed in 2005, graveled, and closed to all vehicle access. No *Botrychium lineare* individuals were detected at this site during 2006 survey efforts, and additional survey efforts are planned.

An additional two *Botrychium lineare* populations are on or near trails open only to pedestrian access. These populations are vulnerable to crushing from pedestrian traffic, but because the threat of crushing related to pedestrian access has not been documented or quantified, we have insufficient information to evaluate whether this threat is imminent.

In summary, although there are a number of *Botrychium lineare* populations that may be subject to road or trail-related threats (eight populations near roads and not protected by conservation measures), we have no information about the impact of these potential threats on the populations or individuals.

Livestock trampling: Livestock trampling was reported as a threat to two *Botrychium lineare* populations (Colorado and Oregon), but the amount of impact was not documented and is therefore uncertain. Because the currently available information does not describe the amount of impact from livestock trampling that is occurring to *B. lineare* populations or individuals, (USFWS in litt. 2007), we have insufficient information to evaluate whether this threat is imminent.

B. Overutilization for commercial, recreational, scientific, or educational purposes.

There is no information indicating overutilization of *Botrychium lineare* for commercial, recreational, or educational purposes. There have been concerns, however, over impacts related to scientific purposes, specifically surveys and monitoring activity. Due to the small size of *Botrychium lineare* populations, the very process of attempting to locate, collect, or monitor this species may impact the species in the form of disturbance during monitoring efforts by researchers and surveyors. Due to the small stature of *B. lineare* individuals, survey efforts may result in reduced survival, reduced reproductive success, or direct mortality due to trampling by researchers and surveyors. In addition, as part of the routine identification process, surveyors clip portions of the plant to allow positive identification using lab techniques (see Taxonomy section). It is unknown whether this practice has any impact on survival of individual plants or of populations. Although surveys occur, at varying periodicity, at the majority of the *B. lineare* populations (14 of 20), this threat was only identified at one population.

According to reports, the Pikes Peak 4 population in Colorado, was adversely affected by human impacts from monitoring efforts. This population has been monitored over more consecutive years than any other known *Botrychium lineare* population (USFWS in litt.

2007). Land managers there are concerned that monitoring for *B. lineare* may, in fact, be responsible for trampling individuals of the species. The population has fluctuated at this site (i.e. in terms of observed individuals) since 1988. While the number of observed individuals has generally decreased since 1996, this decrease has not been linked with impacts from repeated survey efforts.

Based on our evaluation of the best available scientific information, we have no basis for concluding the species is threatened by overutilization for scientific purposes.

C. Disease or predation.

Predation: Grazing by native or domestic animals was reported as occurring at seven sites, and as possibly occurring at one more site. We lack information indicating that *Botrychium lineare* is palatable to grazers such as livestock, native ungulates, or prairie dogs. Potential effects of grazing include direct mortality through predation, and indirect impacts from the introduction of nonnative plant species (i.e., competitors), habitat alterations (i.e., redistribution of shade and light, or altered hydrology or soils), and the disruption of population dynamics (i.e., reduced or altered reproductive success).

Grazing by native or domestic animals that occurs prior to the maturation and release of spores may compromise the capacity for sexual reproduction of affected plants. The specific individual or population level effects of grazing on *B. lineare* are unknown at these sites. In addition, at three sites at which grazing was reported as occurring, Dr. Farrar, a *Botrychium* species expert, recommended that the current management of the sites continue (Beth Burkhardt, Botanist, U.S. Forest Service, Black Hills National Forest, pers. comm. 2006). This suggests that *B. lineare* may tolerate some level of herbivory.

An enclosure was erected at the Washington site to preclude grazing impacts; any effect that grazing may have had on *Botrychium lineare* at this site is now considered historical. Based on the currently available information (USFWS in litt. 2007), the threat of grazing to *B. lineare* is only regional in scope and of moderate exposure (7 of the 20 known populations). The imminence and intensity of grazing, and the impact on the species at these sites are currently unknown.

Disease: We are not aware of any diseases that affect individuals or populations of *Botrychium lineare*.

D. The inadequacy of existing regulatory mechanisms.

Botrychium lineare is considered a sensitive species in Regions 2, 5, and 6 of the U.S. Forest Service (Forest Service), which includes extant and historical *B. lineare* sites found in Colorado, Oregon, Washington, and California (Forest Service 1999, 2000, 2004). The Forest Service in these four states is engaged in a number of activities to benefit *B. lineare*, including annual surveys (California, Colorado, Oregon, Washington), nonnative plant control (California, Colorado, Oregon), and management of livestock grazing in Washington (see also Conservation Measures section).

The National Park Service (Park Service) has policies to promote the conservation of

federally listed or candidate species and other rare or sensitive species within park boundaries (Tara Williams, Botanist, National Park Service, pers. comm. 2000), and is implementing actions designed to conserve *Botrychium lineare*, including control of nonnative, invasive plant species; altering mowing schedules; and restricting chemical treatment of nonnative plant species to spot spraying. The Park Service re-surveys all *B. lineare* sites in Glacier National Park every two years. In addition, the Park Service has had conservation measures in place for *B. lineare* for all sites within Glacier National Park since 2004 (see Conservation Measures section). It is uncertain whether these conservation measures will provide long-term protection of these sites due to the current lack of knowledge about the appropriate or adequate disturbance regimen needed to conserve *Botrychium lineare* sites adjacent to Park roads.

Botrychium lineare is considered to be rare and imperiled by the State Natural Heritage Programs in Colorado, Montana, Oregon, and Washington. The State Heritage Program rankings are not legal designations and do not confer State regulatory protection to this species.

In summary, conservation measures are currently being implemented by the Forest Service in Colorado, Oregon, and Washington, and by the Park Service in Montana; the Forest Service is participating in surveys in Alaska and Montana. It is unknown whether the current efforts by the Forest Service to locate and conserve the species would continue if the species was not a candidate species for listing under the Endangered Species Act. In Forest Service Regions 2, 5, and 6, these efforts would likely continue as long as *B. lineare* was retained as a sensitive species; therefore the threat to the species from inadequate regulatory mechanisms in these areas would likely be low. Also, there is currently no evidence that the lack of known regulatory mechanisms that protect the two populations on private land is having an adverse effect on *B. lineare*. Based on our evaluation, we have no basis for concluding that *B. lineare* is threatened by the inadequacy of existing regulatory mechanisms.

E. Other natural or manmade factors affecting its continued existence.

Small population size: The generally small size of most existing *Botrychium lineare* populations makes this species not only difficult to locate but also vulnerable to extirpation due to stochastic natural disturbances or events. Species that are naturally rare, geographically restricted, or are limited to certain types of habitats are more likely to decline in the face of environmental perturbations than are species that are common, contiguous, and generalist (Akçakaya et al. 1999, p. 220). Most sites occupied by *B. lineare* are generally small with most less than 465 square meters (m^2) (5,000 square feet (ft^2)) in area. Of the three *B. lineare* sites in Oregon, the Lostine Canyon site occupies an area of approximately 10 by 10 m (30 by 30 ft) (Wagner and Wagner 1994, p. 9), and one of the Hurricane Creek sites is found in an area up to 1 hectare or 2.5 acres in size (Oregon Natural Heritage Program 1999). Additionally, 6 of the 20 known extant *B. lineare* sites (30 percent) contained 10 or fewer individuals during the last survey period (Table 1). However, because of regular intragametophytic selfing, *Botrychium* species are not subject to inbreeding depression. They do not carry a genetic load of deleterious alleles sheltered in heterozygous individuals. All of their gene alleles have already been

exposed to environmental selection, only non-deleterious alleles remain in their genome. Because of their immunity to inbreeding depression, fitness is not a function of population size (Farrar 2006, p. 34).

The species' apparent tolerance for, and establishment in, disturbed environments such as road banks and tailings piles, however, suggests that it may tolerate some level of random or periodic disturbance. The amount and type of disturbance the species is able to tolerate and survive is unknown, therefore the threat to the species posed by its current disjunct distribution and small population size is uncertain. While the risk of random environmental events affecting local *B. lineare* populations over a wide geographic area is omnipresent in scope and of significant exposure, the intensity of this threat, and the response of *B. lineare* to this threat is unknown. Furthermore, the disjunct nature of existing population sites over a wide geographic range occurring in a variety of natural and man-made disturbed habitats reduces the likelihood of range wide extirpation of the species from random events.

Bank sloughing: One *Botrychium lineare* location in Oregon was reported as being threatened by erosion and stream bank sloughing; this situation was also reported as potentially threatening an additional population in Alaska. At Lower Hurricane Creek in Oregon, a portion of the original site has been washed away, and what is left is at the edge of a steep undercut bank (Jerold Hustafa, Biologist, U.S. Forest Service, pers. comm. 2006). Stream bank sloughing can be associated with anthropomorphic (e.g. livestock use), or natural alterations to habitats (e.g. floods, stream meandering, beaver dams). Given the current population information (USFWS in litt. 2007), the threat of bank sloughing to *B. lineare* is imminent but localized in scope and of low exposure (1 of 20 known U.S. populations). While the intensity of this threat at this single location is high, overall we do not consider this to be a threat to the species as a whole.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

We are not aware of any conservation agreements specific to *Botrychium lineare*. A Conservation Strategy was completed for *B. lineare* sites in Glacier National Park, Montana, in 2004 (Barton and Crispin 2004). Ongoing conservation actions are listed by State below.

Colorado

- Yellow toadflax (*Linaria vulgaris*) was hand pulled from the large Pikes Peak site (EO 004) in 2003, and the site was spot-sprayed with herbicide (Telar) twice during 2006 (Steve Olson, pers. comm. 2007).
- In 2004, invasive, nonnative species were removed from the Empire site by hand pulling.
- A *Botrychium* workshop that addressed systematics and taxonomy was hosted and funded by the Arapaho-Roosevelt National Forest and Pawnee National Grassland in 2005, and led by Dr. Donald Farrar and Dr. Cindy Johnson-Groh (Don Farrar, Professor, Iowa State University, pers. comm. 2005).

Montana

- Herbicide application via spot-spraying is occurring at four sites to control nonnative

species. Knapweed (*Centaurea* sp.) control is ongoing near two sites in Glacier National Park (Apikuni Flat and Chief Mountain Road). Treatment to control Oxeye daisy (*Leucanthemum vulgare*) is ongoing near two sites (Siyeh Bend and Siyeh South, EO 005) (Tara Carolin, pers. comm. 2007).

- A Conservation Strategy that describes recommended conservation actions for all five sites in Montana was completed in 2004 (Barton and Crispin 2004).
- Within Glacier National Park (Apikuni Flat, Chief Mountain Road, Siyeh Bend and Siyeh South) weed and mowing crews are provided location information for all *Botrychium lineare* sites each spring. Mowing is delayed until after July 15th, restricted to four inch height, and weed treatment is restricted to spot spraying (Tara Carolin, pers. comm. 2007).

Oregon

- The Forest Service is controlling knapweed (*Centaurea* sp.) via hand pulling near the Lostine Canyon site, and is planning to begin controlling hawkweed (*Hieracium argutum*) in 2007.
- Both Hurricane Creek sites are being monitored for Canada and bull thistle (*Cirsium arvense* and *C. vulgare*), both species are known intermittently along the adjacent trail.

South Dakota

- Forest Service has avoidance measures in place at the Boles Canyon site to prevent road-related impacts.
- *Botrychium* workshops led by Dr. Donald Farrar and Dr. Cindy Johnson-Groh were funded by the Black Hills National Forest in 2006.

Washington

- A 9 by 15 m (30 by 50 foot) livestock enclosure has been erected to protect *Botrychium lineare*.
- Taxonomic investigations funded by the Service are being conducted by Dr. Donald Farrar at Iowa State University.

Summary: Conservation measures are being implemented to address some of the potential threats at 9 of the 20 *Botrychium lineare* populations in the eight U.S. states. Invasive, nonnative species are reported to occur within 4 populations, and adjacent to 10 (6 populations for which the amount of habitat impacted was identified and 4 populations for which the amount of habitat impacted was not identified). Conservation measures to reduce the occurrence of invasive species are underway at seven sites in Colorado, Montana, and Oregon. Monitoring to detect presence of additional invasive species is currently conducted at 2 additional sites in Oregon. Thirteen populations occur adjacent to or near roads; avoidance and minimization measures are in place at four sites in Colorado and one site in South Dakota to reduce the impact of road-related activities. Grazing occurs at seven populations, and may occur at one more site. Livestock impacts have been precluded at one site in Washington.

In addition, a conservation strategy was completed for all five sites in Montana, and workshops have been held in Colorado and South Dakota to increase surveyor's

knowledge of the species life history and identification. The workshops should increase the ability of surveyors to locate potential habitat and *Botrychium* subspecies and thereby increase accuracy of reporting for *B. lineare*. Genetic analyses have been conducted on populations in MN and WA to determine whether *Botrychium* present is *B. lineare* or another subspecies. This will clarify the distribution of the species.

SUMMARY OF THREATS

The most frequently reported potential threats to *Botrychium lineare* populations were those associated with invasion by nonnative plant species, non-target herbicide application, road maintenance, recreational use, livestock trampling, livestock grazing effects, and small population size. Based on the best available information (USFWS in litt. 2007), nonnative species occur within 4 of 20 *B. lineare* populations, and occur near an additional 10 populations. Conservation measures to reduce the occurrence of invasive species are underway at seven sites. Non-target herbicide application occurs within one *B. lineare* population. Careful spot-spraying occurs in an additional six locations, but these activities are viewed as primarily beneficial to *B. lineare*. Road maintenance activities and vehicle use occur within or adjacent to 13 populations. Actions have been taken to reduce or remove this threat to five populations. Road maintenance activities and vehicle use are not managed to reduce impacts to *B. lineare* populations at 8 of the 13 populations. Livestock use (trampling) occurs within two populations; the impact of this use on *B. lineare* is unknown. At present we have no specific evidence of the impact of any of these threats on *B. lineare*. Grazing occurs within seven *B. lineare* populations. However, the overall impacts to *B. lineare* populations from grazing are unknown. Grazing use has been precluded at one of these populations through the construction of an exclosure fence. The generally small size of most existing *B. lineare* populations (less than 465 square m (5,000 square ft)) may make populations vulnerable to extirpation due to random naturally occurring events. Conversely, the disjunct nature of existing population sites over a wide geographic range occurring in a variety of natural and man-made disturbed habitats reduces the likelihood of range wide extirpation of the species from random events.

There is a high likelihood that many additional *Botrychium lineare* populations exist given: (1) the extremely large geographic range over which *B. lineare* populations are distributed; (2) 12 new populations have been discovered since 2003 based on limited survey effort; (3) the species is difficult to detect during surveys; and (4) the amount of unsurveyed potential habitat is unquantified, but extremely large, including vast mountainous areas of western Canada. At this point we can not determine whether the species is threatened or endangered in a significant portion of its range because our knowledge of the range is so poor. There is much uncertainty, and very little supporting documentation, regarding the impacts from many of the potential threats previously discussed. Due to insufficient information on the species' habitat requirements and biological vulnerability, and the wide variety of habitat situations where it is found, the magnitude of threats facing the species is largely unknown at most extant sites based on available information. As discussed in the CONSERVATION MEASURES PLANNED AND IMPLEMENTED section, conservation measures have been developed and implemented in at least 5 states where *B. lineare* occurs. Based on our evaluation, we conclude that listing *B. lineare* throughout its range is not warranted and remove it from

the list of candidate species. There is no information to indicate that any of the known *B. lineare* populations constitute a significant portion of the range of the species. If we were to receive information demonstrating that threats to this species had increased significantly (for example, nonnative, invasive species competitively excluding *Botrychium lineare*) and/or evidence of population decline, we would reconsider whether listing is warranted at that time.

For species that are being removed from candidate status:

No Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

DESCRIPTION OF MONITORING

Surveys for *Botrychium lineare* are difficult because of the small stature of the plant. Most recent discoveries (i.e., 12 new populations discovered since 2003) have been associated with surveys conducted in conjunction with project surveys or with the identification of *B. lineare* at already discovered *Botrychium* sites. The following survey efforts, listed by state, are currently planned or underway.

Alaska

- Surveys, funded by the Service, are being conducted by Mary Stensvold of the Forest Service and Dr. Donald Farrar in Alaska and Canada.

California

- Historical locations are being visited and assessed by Forest Service personnel and Dr. Donald Farrar (Farrar 2006).

Colorado

- Several new *Botrychium* sites have been identified as other *Botrychium* species by the Forest Service and Dr. Donald Farrar.
- Monitoring occurs at the large Pikes Peak (EO 004) site every other year (Cameron in litt. 2005, p. 1).
- Surveys were conducted for *Botrychium lineare* on the Arapaho-Roosevelt National Forest from 2002-2006, funded by the Forest Service.
- Surveys were conducted for *Botrychium lineare* and *B. campestre* on the Pawnee National Grassland by Dr. Donald Farrar, the Forest Service, and the Colorado Natural Heritage Program in the spring of 2006, funded by the Forest Service.

Idaho

- One potential *Botrychium lineare* site was identified as other *Botrychium* species by the Forest Service and Dr. Donald Farrar.

Minnesota

- Recent genetic analyses of known *Botrychium campestre* sites have found one *B. lineare* population in an old mine tailings impoundment.

Montana

- Within Glacier National Park biennial site visits occur at all *Botrychium lineare* sites.

Nevada

- Several new *Botrychium* sites have been identified and assessed as other *Botrychium* species by the Forest Service and Dr. Donald Farrar.
- A site visit to another potential *B. lineare* site is planned for 2007.

Oregon

- Annual visits occur to the privately owned Lostine Canyon site by Forest Service personnel.
- Semi-annual site visits occur to both sites on the Wallowa-Whitman National Forest. A complete census was conducted at the Lower Hurricane Creek site in 2005.
- Further surveys, funded by the Service and conducted by the Forest Service are planned for 2007.

South Dakota

- Recent surveys have identified three new sites of *Botrychium lineare* in South Dakota (one at the Wind Caves National Park, and two on the Black Hills National Forest).

Washington

- Annual monitoring conducted by the Forest Service occurs at the only site in Washington (Amy Cabral, Biologist, U.S. Forest Service, pers. comm. 2006).

Wyoming

- Recent surveys have identified two new sites of *B. lineare* in Wyoming, both on the Black Hills National Forest.

Botrychium lineare is a perennial species that may or may not appear during any given year, therefore long-term monitoring is needed to detect trends within populations. Only two sites (one at Bailey Creek on the Colville National Forest in Washington and one at Pikes Peak, Colorado), have been monitored for over ten years (Cameron 2005, p.1; Amy Cabral, Biologist, U.S. Forest Service, pers. comm. 2006). To our knowledge, only the site at Pikes Peak is monitored using a well established protocol. This protocol utilizes censusing techniques with a permanent macroplot 30 x 60 m (98 x 197 ft). In addition, plants are tagged. Census data has shown a wide variation in the number of plants observed, thus it is difficult to determine the trend of this population.

In conjunction with the above monitoring efforts, a number of workshops on identification of *Botrychium lineare* have been held. Workshops were held in Idaho in 2002 and 2004, and in South Dakota in 2006 by species experts Dr. Donald Farrar and Dr. Cindy Johnson-Groh. The Idaho workshops focused on identification of *B. lineare* and other closely related *Botrychium* species, and on the status of *B. lineare*. Participants in the 2002 workshop visited the historical *B. lineare* site in Idaho and searched for the species but failed to locate any individuals. Both of the Idaho workshops were funded by the Forest Service. The workshop held in South Dakota also focused on identification of *B. lineare*, and was funded by the Black Hills National Forest.

In addition to the monitoring efforts described above, a population status report on the Colorado occurrences was completed in 2004 by the Forest Service (Popovich 2004), and a conservation strategy for all Montana occurrences was completed in 2004 (Barton and Crispin 2004).

COORDINATION WITH STATES

In order to accurately determine the status, existing threats, ongoing or upcoming conservation measures, and monitoring efforts for all populations of *Botrychium lineare* in the United States, we solicited information from over 60 individuals associated with Federal, Tribal, and State agencies; as well as educational institutions and private individuals and organizations. These individuals are from all States where the species is known to reside, as well as several States where historical locations are known. State agencies that were contacted include the Alaska Natural Heritage Program, the California Natural Diversity Database, the Colorado Natural Heritage Program, the Idaho Conservation Data Center, the Minnesota Natural Heritage Program, the Montana Natural Heritage Program, the Nevada Natural Heritage Program, the Oregon Natural Heritage Program, the South Dakota Natural Heritage Program, the Utah Conservation Data Center, the Washington Natural Heritage Program, and the Wyoming Natural Diversity Database.

Federal agencies that were contacted include numerous U.S. Forest Service offices including the Colville National Forest in Washington; the Sawtooth National Forest in Idaho; the Humbolt-Toiyabe National Forest in Nevada; the Black Hills National Forest in South Dakota and Wyoming; the Pike and San Isabel National Forests and the Arapaho-Roosevelt National Forests, and the Pawnee National Grasslands in Colorado; as well as the Regional Offices of Regions 2, 4, and 10.

Tribal agencies that were contacted include the Blackfeet Nation, and Confederated Salish and Kutenai Tribes in Montana. We also contacted species experts including Dr. Donald Farrar at Iowa State University; Dr. Cindy Johnson-Groh at Gustavus Adolphus College, Minnesota; Dr. Warren Hauk at Denison College, Ohio; and Dr. Peter Lesica, Montana. Other private individuals included Peter Root, Drake Barton, Toby Sprohille, Peter Zika, and Potlatch Corporation. This outreach effort continues to grow with the range of the species; similar outreach efforts have occurred for past Candidate Notices of Review.

Indicate which State(s) did not provide any information or comments: Not applicable.

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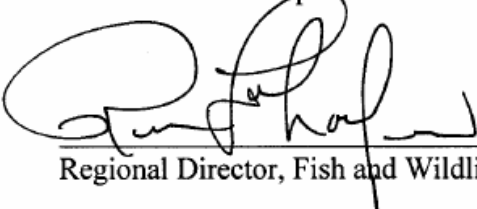
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APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve: 
Regional Director, Fish and Wildlife Service

6/1/07
Date

Concur: 
Acting Director, U.S. Fish and Wildlife Service

November 27, 2007
Date

Do not concur: _____
Director, Fish and Wildlife Service

Date

Director's Remarks:

Date of annual review:

Conducted by: _____

Date _____

Reviewed by: _____
Conservation Planning Branch Chief

Date _____

Listing, Recovery, and Conservation
Partnerships Division Chief

Date _____

Field Office Supervisor

Date _____